

APPENDIX A

BUREAU OF WASTE MANAGEMENT

STANDARD OPERATING PROCEDURES

**KANSAS SOLID AND HAZARDOUS WASTE MANAGEMENT
PROGRAMS**

BUREAU OF WASTE MANAGEMENT APPENDIX A TABLE OF CONTENTS

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STANDARD OPERATING PROCEDURE BWM-002
GUIDELINES FOR CONDUCTING RCRA INSPECTIONS

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SOP No. BWM-002

GUIDELINES FOR CONDUCTING RCRA INSPECTIONS

1.0 PRE-INSPECTION PROCEDURES

Prior to conducting a RCRA inspection, the inspector should take time to review the office files regarding the facility. This is to become familiar with the type and quantity of waste generated, disposal methods for regulated waste, compliance status, and contact person at the facility. In most cases, the inspection will be conducted on an "unannounced basis" (not pre-scheduled with the facility). The exception to this rule would be when the inspection will be facilitated by the presence of the contact person, the inspector may inform him of the date and time of the upcoming inspection. In these cases, only a 24 to 48 hour prior notice will be given.

The inspector should have the following items when conducting RCRA inspections:

- Sufficient copies of all inspection forms, including appropriate checklists;
- Copies of handouts to be given to facilities;
- The inspector's State of Kansas employee identification card;
- A supply of business cards;
- A clipboard and writing instruments;
- Sampling containers and sampling equipment (including laboratory forms);
- Appropriate health and safety equipment (i.e. protective eye wear, hearing protection, steel-toed boots, hard hat etc.);
- A digital camera for documenting findings and a disposable or regular 35 mm camera for a backup (Be sure to have extra disks or memory cards for the digital camera);
- Copies of both the Kansas and EPA Statutes and Regulations regarding hazardous/solid waste;
- Binoculars;
- Flashlight (preferably intrinsically safe).

2.0 INSPECTION PROCEDURES

Upon entering the facility, the inspector should identify himself as a Kansas Department of Health and Environment Staff Member, and request to see the contact person (if one has been previously identified). If no contact person is known, or if the contact person listed in the file is not available, the inspector should request to speak to someone in management. The inspector should present the contact person with a business card, and if requested, show his State of Kansas employee identification card.

If the inspector is refused entry to the facility, or to any facility records or processes that he must see to complete the inspection, he should first attempt to arrange for the plant manager to contact the Compliance and Enforcement Unit Chief of BWM by telephone. If the contact person refuses, the inspector should leave the plant site immediately and contact the BWM Compliance and Enforcement Unit Chief by telephone for instructions.

The entry phase of the inspection should take place in an office or conference room if possible, to allow a relaxed atmosphere free of the noise and distraction of any manufacturing areas of the facility. The inspector should explain the scope of the inspection, including whether it is routine, a follow-up, the result of a complaint, or for a special purpose. Examples of the type of information that should be obtained in this entry interview are: the kind of facility; number of employees; processes and products manufactured; types and quantity of wastes generated; and where wastes are disposed or recycled. At this time, the inspector should also inform the industry representative of his right to declare information confidential, so long as he has justification for such a request.

The following guidelines should be followed when completing inspection checklists and forms:

- All applicable items on the form should be addressed. If information is not available, this should be noted. If a section of the form does not apply, enter a N/A in that section.
- The summary of the inspection report should contain any information, which the rest of the form does not adequately cover. Examples include commitments made by the facility to forward information, environmental problems noted that might be of interest to another KDHE program, and diagrams of processes to help explain how specific waste streams are generated. The summary should also include a detailed description of all violations found.

After completing as much of the inspection as possible in the office, the inspector should request to be shown all process areas where hazardous or potentially hazardous waste are generated, stored, treated and disposed. Careful observation of all manufacturing processes

may reveal a potentially hazardous waste, which the plant manager has neglected to review with the inspector. Examples of such wastes include those discharged to the sewer such as metal-treatment rinse waters, or liquids contained in tanks that may only be wasted every few years. The inspector should conduct a thorough walk through the entire plant and grounds. There may be disposal areas, either solid or hazardous waste, that are not easily visible on a general walk through of the process areas. The inspector should not let the plant manager rush or guide the inspection in any way. The inspector should follow all of the facility's safety guidelines at all times and should not proceed to any area of the facility without a facility representative.

After inspecting the process areas of the plant the inspector should request to review required documents (i.e. waste reports, manifests, service contracts, Material Safety Data Sheets, etc.). After completing the document review, the inspector should inquire as to whether additional facility personnel need to be present for the exit interview. The exit interview should include the review of all hazardous, or potentially hazardous, wastes generated; their generation rate, the amount presently in storage and their disposal methods. The plant manager should be given a Notice of Compliance/Non-Compliance (NOC/NC) during the exit interview. The inspector should review all items listed on the NOC/NC not in compliance with state or federal regulations. The NOC/NC should give a deadline for the correction of all items out of compliance. The inspector is given latitude in setting this deadline, but usually within 30 to 60 days, depending on the circumstances. If the facility is in compliance with all applicable regulations, they will be given an NOC/NC that will indicate that the facility was found to be in compliance.

During the exit interview, the inspector should also provide the plant manager with any guidance documents needed to correct deficiencies discovered during the inspection. The inspector should also answer any questions the facility may have and review any commitments the facility has made to supply the inspector with documents or test results. Due to the extremely complex nature of the hazardous waste program, the inspector should not feel obliged to provide an immediate answer to all questions. A promise to obtain the correct answer to the question and to forward this information to the industry representative fulfills the inspector's responsibility. Copies of the inspection report may be supplied to the facility upon request.

In some cases, it may be impracticable to issue a NOC/NC at the time of the inspection. In these cases, a letter will be issued to the facility outlining violations within 10 days of the inspection (if possible).

It should also be explained to the facility that reports are reviewed by BWM and that additional violations may be issued.

3.0 SAMPLING

During the course of the inspection, it may be necessary for the inspector to collect samples of a waste stream. Samples may be collected to determine if an unknown waste is hazardous, or to verify the results of analyses previously conducted by the facility. Samples may also be collected for other reasons not easily identified in this document.

Procedures for collection of any samples should be in strict accordance with the Standard Operating Procedure BWM-005 for Sampling.

4.0 POST-INSPECTION PROCEDURES

The completed NOC/NC or letter and inspection checklist/summary should be organized in the following manner:

- CMEL forms (only to be provided to the Compliance and Enforcement Unit Chief)
- NOC/NC or letter given or sent to the facility.
- Inspection checklist(s);
- Inspection summary
- Photographic logs;
- Supporting documentation.

The original forms should be forwarded in the above listed order to the Waste Compliance, Enforcement, and Policy Section Chief. A copy of these documents should be forwarded to the Compliance and Enforcement Unit Chief. A copy of these documents should also be maintained in the district waste files. Whenever an inspector conducts a RCRA inspection in a district other than his own, a copy of the letter and the entire inspection form should be forwarded to the district office for the district in which the facility is located.

STANDARD OPERATING PROCEDURE BWM-005

GUIDELINES FOR WASTE SAMPLING

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SOP No. BWM-005

GUIDELINES FOR WASTE SAMPLING

1.0 INTRODUCTION

In general, sampling of waste materials or contaminated media requires the collection of samples that are adequate in size and as representative as possible, depending on the reasons for sampling. Sampling situations vary widely. Therefore, no universal sampling procedure can be recommended. Rather, several procedures will be outlined for sampling different types of wastes in various states and receptacles.

The following steps should be taken prior to undertaking a sampling event:

- Research available background information about the waste (composition, form, concentration, etc.).
- Determine equipment and procedural needs for safe sampling.
- Consider proper locations for sampling.
- Determine the volume of samples to be taken.
- Review procedures for sample collection.
- Review procedures for containing and handling samples.
- Review chain-of-custody procedures.
- Identify necessary packaging, labeling, and shipping requirements.
- Schedule sample analyses with the laboratory.
- Review your sampling kit to ensure that all necessary equipment is included, as listed in Section III.

In some cases, it may be appropriate to conduct a preliminary survey of the facility prior to sampling. This would consist of a brief site visit and survey during which safety requirements of the site would be ascertained and a sampling plan developed by the program/project manager, or the inspector.

2.0 SAMPLING PLAN

If a sampling plan is developed, it should at a minimum include: purpose for the sampling; proposed procedures for sampling, including the type, depth, and number of samples; proposed locations of the samples (including site drawing if available); type of analysis for each sample (including type of container and amount of sample required for each test); and data review procedures.

3.0. SAMPLING EQUIPMENT

As a general rule, sampling equipment used should be disposable. Dippers, scoops, and similar devices for solids samples should be placed in plastic bags for later disposal or clean-up. Liquid samples from barrels or tanks should be withdrawn in inert tubing such as glass, and the tubing should then, if practical, be broken and abandoned within the barrel or tank. If incineration or recycling of the barrel contents is contemplated, disposal of the tubing may be in other suitable receptacles.

In cases where sampling equipment is reusable, decontamination of the equipment is necessary to avoid cross-contamination. Sampling equipment must be thoroughly cleaned with either soap and water or solvent.

In general, metal sample containers should not be used on hazardous waste site investigations, but if used they must be grounded, preferably to the drum or tank being sampled, while sample transfer is accomplished. All metal containers used should be stainless steel. Ambient air sampling on hazardous waste sites must be accomplished with spark-free equipment if explosive vapors are present (most sampling equipment can be a spark source).

The following is a list of sampling equipment. The list is subdivided into six sections: sampling equipment, testing equipment, shipping and packing equipment, documentation equipment, and other equipment. The following sections will discuss the application of the listed equipment.

Sampling Equipment

- Sample containers (plastic and glass), caps, liners (check with laboratory)
- Soil samplers (auger, scoop, steel spoon, shovels, etc.) (All stainless steel)
- Non-sparking bung wrench
- Wrench for loosening bolts on open-head drum rings
- Colli-Wasa (liquid drum sampler)
- Pans (plastic and aluminum)
- Box Knife
- Bailer

Field Testing Equipment

pH paper or pH meter
Water level indicator
Conductivity meter

Shipping and Packing Equipment

Vermiculite or equivalent packing material
Plastic bags
Sample labels
Tape (Clear and Duct)
Picnic coolers
Ice Packs
String or flexible wire
Zipper-type plastic bags (gallon size)

Documentation Equipment

Water proof felt tip pen
Sample Submission form
Field notebook
Custody Seals
Disposal and digital camera

Decontamination Equipment

Spray bottle with Alconox/water solution
Spray bottle with water
Distilled/deionized water
Alconox (detergent)

Other Equipment

Nylon rope
Plastic covers/ground cloth
Paper towels
First Aid kit
Bug spray (do not store with containers or decontamination equipment)
Sunscreen (do not store with containers or decontamination equipment)
Hand-wipes
Appropriate PPE (gloves, tyvek, booties, face shield, etc.)

4.0 SAMPLING PROCEDURES

Wastes encountered are usually multi-phase mixtures and are stored in receptacles of different sizes and shapes. No single series of sampling points can be specified for all types

of receptacles.

The following procedures are recommended for sampling wastes in various media and types of receptacles. These procedures will need to be modified to meet the site-specific conditions and objectives. Receptacles (i.e., drums, tanks, etc.) should only be sampled when necessary to meet enforcement or clean-up requirements.

4.1 Sampling a Drum

Opening of drums or other sealed receptacles may be hazardous to sampling personnel unless proper procedures are followed. Gases can be released, or pressurized liquids can be expelled.

A bulging drum usually indicates that it is under high pressure and should not be sampled until the pressure can be safely relieved. A heavily corroded or rusted drum can readily rupture and spill its contents when disturbed and should not be sampled. Opening the bung of a drum can produce a spark that might detonate an explosive gas mixture in the drum.

Drums should not be moved or opened unless it can be ascertained beyond a reasonable doubt that the drum being moved is structurally sound. Drums standing on end, with bung up, should be opened by bung wrench. Drums on sides may be opened similarly if it is possible to safely rotate the drum so that the bung is high.

The following procedures should be observed:

- Choose a drum whose bung is up. (Drums with the bung on the top should be upright. Drums with bungs on the side should be lying on the side with the bung up.)
- Slowly loosen the bung allowing any gas pressure to release. Remove the bung and collect a sample through the bung hole with a disposable glass tube, which should be broken off afterwards and left in the drums, if possible.
- Replace the bung in the barrel after collecting a sample.

When there is more than one drum of wastes to be sampled at a site choose an appropriate method to establish sampling points.

4.2 Sampling a Vacuum Truck

Sampling a vacuum truck requires opening a drain plug or collecting a sample from the tank hatch using glass tubing, suction hose, or dipper. In some trucks obtaining a

sample requires climbing access rungs to the tank hatch. These situations present accessibility problems to the sample collector. Preferably, two persons should perform the sampling: one person to do the actual sampling; the other to hand the sampling device to the sampler, to stand ready with the sample container, and to aid in case of any problems. The sample collector positions himself to collect samples only after the truck driver has opened the tank hatch. The tank is usually under pressure or vacuum. The driver should open the hatch slowly to release pressure or to break the vacuum.

The following procedures are recommended:

Let the truck driver open the tank hatch.

Using protective sampling gear, assume a stable stance on the tank catwalk or access rung to the hatch.

Collect a sample through the hatch opening with a glass tube, which should be removed and disposed of properly.

If the tank truck is not horizontal, take one additional sample each from the rear and front clean-out hatches and combine all three samples in the same sample container.

When necessary, carefully take a sediment sample from the tank through the drain spigot.

4.3 Sampling a Barrel, Fiberdrum, Can, Bags, or Sacks Containing Powder or Granular Waste.

Dry powdered or granular wastes tend to generate airborne particles when the containers are disturbed. This may be a safety consideration. The containers must be opened slowly. The barrels, fiberdrums, and cans must be positioned upright. If possible, sample sacks or bags in the position you find them. Standing them upright might rupture the bags or sacks.

The following procedures are to be used:

Collect a sample from the container with the appropriate sampling device. Withdraw samples through the center of the receptacle and, if appropriate, at different points diagonally opposite the point of entry to try to obtain a composite of the entire container.

4.4 Sampling a Pond

Storage or evaporation ponds for hazardous waste vary greatly in size from a few

meters in diameter to a hundred meters. It is difficult to collect representative samples from the large ponds without incurring astronomical expense and assuming excessive risks. Any samples desired beyond 3.5 meters from the bank may require the use of a boat, which is very risky. The information sought must be weighted against the risk and expense involved in collecting the samples. A pond sampler can be used to collect samples as far as 3.5 meters from the bank.

After observing all recommended safety procedures, the following procedures are recommended:

Divide the surface area of the pond into an imaginary grid. Take three samples, if possible; one sample near the surface, one sample at mid-depth or at center, and one sample at the bottom. Repeat the sampling at each grid section over the entire pond or site. If desired and appropriate, combine samples from equal depths into one composite sample.

4.5 Sampling a Waste Pile

A waste pile can range from a small heap to a large aggregate of wastes. The wastes are predominantly solid and can be mixtures of powders, granules, and large chunks.

If possible, take samples from at least three different points of the waste pile:

- 1) Near the top of the pile,
- 2) Around the pile near the center height, and
- 3) Near the base of the pile.

Additional samples may be required depending on the size of the pile and the reasons for sampling.

4.6 Sampling a Storage Tank

Sampling a storage tank usually requires climbing to the top of the tank through a narrow vertical or spiral stairway while wearing protective equipment and carrying sampling paraphernalia. This sampling should be conducted by no less than a two-person team. A representative of the company who should open the sampling hole that is usually located on the tank roof should accompany the sample collector.

If possible, collect one sample each from the upper, middle, and lower sections of the tank. If desired and appropriate, combine the samples in one container and submit it as a composite sample.

4.7 Sampling Contaminated Media

Groundwater, surface water, soils and sediments can all become contaminated. Standard operating procedures for sampling of these media are presented in the appendices of the BER portion of the Division of Environment QMP (BER-01 through BER-04 respectively).

4.8 Collecting a Wipe Sample for PCB analysis

For the most representative results the surface to be sampled must be smooth and impervious. It is important to communicate in advance with the laboratory that will be performing the analysis in case specific materials or procedures must be used in sample collection and preservation to fulfill their needs for analysis. The general procedure for sampling includes applying an appropriate solvent such as hexane to a piece of 11 mm filter paper or gauze pad. This moistened pad held by stainless steel forceps or freshly gloved fingertips must then be used to thoroughly swab an area of the surface to be sampled (designated in advance by using a template) to be precisely 100 cm². The template must be thoroughly cleaned between samples.

After thoroughly swabbing the area the resulting wipe must be stored in pre-cleaned glass jars at 4⁰ C prior to analysis. A field blank consisting of an unused pad moistened with the same solvent should also be collected and analyzed for each sampling event.

5.0 SAMPLE VOLUME, ORDER, AND PRESERVATION

A sufficient volume of sample must be collected, so that it is adequate in size for all needs, including laboratory analysis, and splitting with other organizations involved, etc. In collecting liquid waste samples in drums, vacuum trucks, or similar containers, 1,000 ml of a sample is usually sufficient. Hazardous wastes usually contain high concentrations of the hazardous components, so only a small aliquot of the sample is used for analysis.

When sampling contaminated media, the size and material of necessary sample containers varies greatly depending upon the media sampled, the analysis desired, and the specific laboratory that will perform the analysis. Check with laboratory personnel prior to the sampling event to ensure the proper containers are taken to the field.

The proper method for sample preservation will depend upon the type of media sampled and the requested analysis. Preservation methods can include both chemical and physical measures. Check with laboratory personnel prior to the sampling event to determine the necessary preservation methods.

All samples should be taken in the proper order if possible. The proper order will be from the area of least suspected concentration to the area with the most suspected concentration. Also, when a given sample will be analyzed for several parameters (i.e. volatiles, metals, semi-volatiles, etc.), the sample containers should be filled as follows: volatiles (including

OA-1), semivolatiles (including OA-2 and PNAs), pesticides and herbicides, miscellaneous inorganics (pH, conductivity, Total solids, etc.), and then metals.

6.0 DUPLICATE SAMPLES

If applicable, pre-select sampling locations where duplicate samples will be collected at random. All duplicate samples should be collected with the same equipment as the original sample. Duplicate samples should be collected and analyzed in the same manner as the other samples. The purpose of the duplicate sample is to check for sampling variations.

7.0 SPLIT SAMPLES

Split samples should always be offered to a facility in advance of sampling. Aliquots of the collected sample should be given to the permittee or regulated facility, if requested. In most circumstances, the permittee or regulated facility should provide their own sample containers. If they do not have the appropriate container, then the inspector should provide a container.

STANDARD OPERATING PROCEDURE BWM-006

SAMPLE CHAIN OF CUSTODY PROCEDURES

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SOP No. BWM-006

SAMPLE CHAIN OF CUSTODY PROCEDURES

1.0. INTRODUCTION

After collection and identification, all samples shall be maintained under chain of custody procedures. If the sample collected is to be split with the owner or operator of the site or with other regulatory agencies, it should be allocated into similar sample containers. Sample labels with identical information should be attached to each of the samples and marked as "split". The requesting official may be required to supply the appropriate containers.

Each person involved with the sample must know chain of custody procedures. Due to the evidentiary nature of sample-collecting investigations, the possession of samples must be traceable from the time the samples are collected until they are introduced as evidence in legal proceedings. To maintain and document sample possession, chain of custody procedures must be followed.

2.0. SAMPLE CUSTODY

A sample is under custody if: a) it is in the sampler's actual possession; or b) it is in the sampler's view, after being in his/her physical possession; or c) it was in the sampler's physical possession and then he/she locked it up to prevent tampering; d) it is in a designated and identified secured area, or e) if the sample is secured with tamper resistant Custody Seals while in storage.

3.0. FIELD CUSTODY CONSIDERATIONS

As few people as possible should handle the samples. The field sampler is personally responsible for the care and custody of the samples until they are transferred or properly dispatched.

4.0. TRANSFER OF CUSTODY AND SHIPMENT

- A sample collection form that contains the chain of custody record must accompany samples. When transferring the possession of samples, the individuals relinquishing and receiving will sign and date the sample collection form. This form documents transfer of custody from the sampler to another person, to a mobile laboratory, or to the permanent laboratory.
- Whenever samples are split with a facility or government agency, a separate chain of custody record should be prepared for those samples and marked to indicate with whom the samples are being split.

- Sample collection forms showing identification of the contents should accompany all packages. The original form will accompany the shipment, and the inspector should retain a copy.
- If sent by a common carrier, a bill of lading should be used. Receipts for bills of lading should be retained as part of the permanent documentation.

STANDARD OPERATING PROCEDURE BWM-007
GUIDELINES FOR FIELD SCREENING AT RCRA FACILITIES

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SOP No. BWM-007

GUIDELINES FOR FIELD SCREENING AT RCRA FACILITIES

1.0 INTRODUCTION

Field screening of potentially contaminated material is a valuable tool in the field. This SOP provides a description and operating instructions of certain field screening equipment.

2.0 DIGITAL pH METER

Function: pH meter is a battery or line operated digital pH/mV/temperature meter with automatic temperature compensation (ATC)

Follow the manufacturers directions for calibration and use.

3.0 YSI - SALINITY CONDUCTIVITY TEMPERATURE METER (S-C-T)

Function: S-C-T Meter is portable, battery powered, transistorized instrument designed to measure salinity conductivity and temperature:

Follow the manufacturers directions for calibration and use.

STANDARD OPERATING PROCEDURE BWM-008
USE OF DIGITAL CAMERAS FOR RCRA INSPECTIONS

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SOP No. BWM-008

USE OF DIGITAL CAMERAS FOR RCRA INSPECTIONS

1.0 INTRODUCTION

1.1 Purpose

To assure that consistent and reliable standards exist and are adhered to by all technical staff performing investigations and inspections requiring photographic documentation. This document discusses the protocol and rationale for using a digital camera for documentation, when the use of traditional film cameras are justified, sets forth minimum requirements to ensure the credibility of digital photographs (photos), and provides suggested practices related to digital camera use and technology.

1.2 Program Scope

A sharp, clearly lit photograph is often only second to the inspector's personal observation of the subject when it comes to case winning evidence. Traditionally, the Bureau of Waste Management (BWM) has relied solely on silver-halide film photography for visual documentation, however, technological advances and the potential for budgetary savings have led the program to employ the use of digital cameras by almost every field staff member. This SOP shall apply to all photo documentation performed in the course of any RCRA solid or hazardous waste investigation.

2.0 USE OF PHOTOGRAPHIC FORMATS

2.1 Silver-Halide Film Cameras

Traditional silver-halide film cameras are not to be used on a routine basis to document field investigations. Exceptions to this rule are the use of "disposable" 35mm cameras when a digital camera is not available or is malfunctioning.

2.2 Digital Cameras

Each office shall make available digital cameras for documentation of field investigations. The camera must use a unique file identifier, time, and date stamp. It is not necessary that the time and date stamp appear on the printed image, only that they be recorded when the image is captured.

3.0 PHOTOGRAPH REQUIREMENTS

3.1 Accuracy

The digital photograph has several advantages to traditional film photographs; reduced costs, greater security, accessibility, and the ability to instantly review photos taken during the investigation. However, if the photo does not accurately represent what you saw, these advantages become moot. All staff must be familiar with the operation of the camera before proceeding with an investigation. If the photo is used as evidence in an enforcement case, the person in the field when the photograph was taken may be asked to verify the authenticity of the image, how it was acquired, its relevance to the case, and how it corroborates testimony as to issues which may be disputed in the case.

3.2 Photograph Composition

Photographs should be taken of every violation or questionable item/event found during an investigation. The three most common mistakes to avoid in providing photographic documentation are too few photographs, poor quality photographs, and lack of subject identification in photographs. Photographic documentation should tell the story with as little need for narrative as possible. This is done by capturing three types of images in a series.

The “establishing shot” is a photograph taken from a distance that shows not only the subject, but also one or several permanent landmarks that can be used for reference in establishing the exact location. It may actually be necessary in some cases to take several “establishing shots” in order to correctly reference the subject. You may also wish to indicate a compass orientation to further establish the location of the subject matter.

The “subject shot” should emphasize a specific object or event. Sometimes it will be taken in a series so that all sides of the subject can be viewed. Removable “Post-its” may be used to identify the item in the photograph. Numbers or identifiers on the “Post-its” should be recorded in the inspection notes for reference and easy identification when writing your report.

Lastly, a “detail shot” may be needed to provide further information about the item or event in question. Most digital cameras have a macro feature that will allow close-ups to be readily obtained.

3.3 Zoom

Most digital cameras are equipped with two types of zoom feature, optical and digital. Optical zoom is “true zoom” or telephoto, which makes the image appear closer without losing detail. It is acceptable to use the optical zoom feature to obtain

more representative images. Digital zoom is merely built-in computer image enlargement, which makes the image appear closer by making it bigger. Unless it is absolutely necessary to use digital zoom, possibly because of safety concerns with getting too close to the subject matter, using digital zoom should be avoided.

4.0 ESTABLISHING PROPER CHAIN OF CUSTODY

4.1 Before the Investigation

Verify that the camera has sufficient battery life for the investigation. Also verify that the date, time, filename, and other applicable settings are correct. Ensure that there is enough storage media for the anticipated number of photographs to be taken.

4.2 During the Investigation

One of the advantages of digital cameras is that photos can be reviewed immediately to be certain that important details are captured and notes can be corroborated. Any poor quality pictures can be deleted and shot again before scene conditions change. This is the only time when pictures may be deleted. The preferred format for photo documentation is TIFF (Tagged Image File Format), however, this format results in very large files and is not recommended when more than a few photos are being captured. For most investigations, the camera should be set to capture images in JPEG (Joint Photographic Experts Group) format. While this format is classified as a “lossy” format, meaning that repeated viewing, which decompresses and then re-compresses the file, may result in degradation of the image, the loss should not affect the integrity of the evidence. Also, the file identifier on the camera should be set to name each photo in sequential rather than series mode, so that every picture taken with that camera has a unique filename.

4.3 After the Investigation

DO NOT VIEW THE IMAGES ON A COMPUTER UNTIL THEY HAVE BEEN PROPERLY ARCHIVED

Immediately after the investigation is completed, the camera and all media storage devices used during the investigation should be taken back to the office and downloaded onto a secure computer equipped with a compact disc writer. The images should be placed in a computer folder that has been named with the facility name or identification number, and the date of the inspection. An example would be “KSD123456789042103”, which would be the investigation of KSD123456789 on April 21, 2003. Another example would be “JohnSmithDump042103”. Do not erase any images.

Each office should maintain, in a secure location, a compact disc for archive storage

of all photographs taken during RCRA investigations. Make sure that the compact disc is labeled “CD-R” and not “CD-RW”. The compact disc should be labeled with the title “RCRA Inspection Photographs: Enforcement Sensitive”, along with the office name, disc number, and the accumulation start date for the disc. When the disc is nearly full, the last inspection date should also be placed on the label.

After downloading the images to the computer, copy the folder to the compact disc. Return the compact disc to the secure location. You may now view the images on the computer or copy the images to other storage devices, such as floppy disks, other computers, or e-mail.

4.4 Report Preparation

It is not necessary to include all pictures in the inspection report, but each violation should be supported by photo documentation. All photos referenced in the report text must be attached, and all photos attached must be referenced.

Include a statement in your report which states “The digital photographs contained in this report were recorded directly to an archival compact disc prior to viewing on a computer system. KDHE certifies that such digital photographs are thus identical to the digital photographs taken during the investigation”.

If it is necessary to enlarge, lighten, or otherwise alter an image to provide greater clarification, this transformation should be noted in the report. If the image is altered, do not name it the same as the original. Instead, place “mod” at the end of the file name, such as “MVC253mod.jpg”.

Facility Photograph Log

4. Photographer_____
5. Facility Name_____
6. Facility _____ Identification _____ Number _____ (if available)_____
2. Type of Camera Used_____
3. Digital recording media _____
4. Photos were Archived by _____
5. Archive CD:_____

Date	Time (camera recorded time)	Photo Filename (MVC- xxx.jpg)	Modifications made to digital image (if any)	Description of Image

STANDARD OPERATING PROCEDURE BWM-009 FOR THE GARMIN GPS III+

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SOP No. BWM-009
STANDARD OPERATING PROCEDURE
FOR THE GARMIN GPS III+

1.0 INTRODUCTION

1.1 Purpose

This Standard Operating Procedure (SOP) will outline the functionality of the Garmin GPS III+ for the Bureau of Waste Management (BWM). The Garmin GPS III+ is a handheld navigation tool to be used primarily to assist field staff to find a predetermined location (sample point/area), to determine spatial relationships, and to mark locations of interest for computer database entry and mapping.

1.2 Program Scope

The Garmin GPS III+ has a horizontal positional accuracy of **4-7 meters (12-20 ft.)** with Selective Availability (SA) off and good satellite coverage. If the satellite coverage is limited (less than 4) the accuracy could drop to **10-20 meters (33-66 ft.)**. The unit can be used for navigation, and to acquire point location for general information, such as the front gate of a facility.

The unit can be used to locate specific sampling sites (such as monitoring wells or air sampler locations) where the relative location between sites is important as long as individual sites are not within **40 meters (132 ft.)** of each other. If greater levels of accuracy are required, for detailed mapping or legal definition, the user should consider using the AshTech Reliance system, the Magellan ProMark system or conventional land surveys.

The unit can be used to map points for GIS features with the restriction that polygons of less than **40 meters (132 ft.)** on a side may not reproduce well in the mapping software. If higher levels of accuracy are required and/or the information will be used primarily for mapping, the user should consider using the AshTech Reliance system, the Magellan ProMark system or conventional land surveys.

This procedure applies to the Garmin GPS III+ units only. The elements of this SOP will be applicable to all Garmin GPS III+ deployed within the BWM. Operators/staff collecting data for databases/mapping shall conform to the SOPs of the Geographic Services Unit within the Office of Information Services under the Office of the Secretary. This SOP (BWM-009) will describe the necessary training for field operation, maintenance, and troubleshooting of the Garmin GPS III+.

2.0 MINIMAL TECHNICAL QUALIFICATIONS AND TRAINING OF OPERATOR

A. The operator shall be familiar with all applicable procedures described in the

- operator's manual.
- B. The operator shall be familiar with this SOP and any applicable Bureau/Program SOPs.
- C. The Bureau's/Program's GPS Administrator verifies who is ready to operate the unit.

3.0 OPERATIONAL INSTRUCTIONS

- A. The operator shall inspect the GPS unit and related equipment for proper, safe operation before going to the field. Any problems with the unit detected by the operator shall be reported to his/her Bureau's/Program's GPS Administrator. Refer to the troubleshooting section for additional information.
- B. The Garmin web site (<http://www.garmin.com/support>) should be visited periodically by the Bureau's/Program's GPS Administrator to check for the availability of product updates for the GPS III+ operating software and/or the *MapSource*® software.
- C. Unless permission has been given beforehand by the Bureau's/Program's GPS Administrator, only he/she may delete waypoints or change settings on the unit.
- D. Operators should be mindful of the quality of all data to be submitted for database and mapping purposes, and should keep appropriate documentation to validate their data sets.

4.0 INITIAL CALIBRATION OF UNIT

- A. Allow the unit approximately five minutes to “**AutoLocate**” itself under the following circumstances.
 - a. The first time it is used out of the box.
 - b. After it has been moved with the power off over 500 miles from last usage point.
 - c. If it's memory has been cleared and all internally stored data has been lost.
 - d. After a software update.
- B. The following procedure describes how to change the settings that need to be changed by the Bureau's/Program's GPS Administrator before the unit is given out for field data collection.
 - a. From any screen press the “**MENU**” button twice to bring up the “**Main Menu**” screen.
 - b. Highlight “**Setup**” and press the “**ENTER/MARK**” button.
 - c. Using the rocker keypad, select the “**Time**” tab at the top of the screen.
 - d. Select the “**Time Format**” field and press the “**ENTER**” button.
 - e. Highlight “**UTC**” and press the “**ENTER**” button.

- f. Select the “**Time**” tab at the top of the screen and move to the “**Position**” screen.
- g. Select the “**Position Format**” field and press the “**ENTER**” button.
- h. Highlight “**hddd.dddd**” press the “**ENTER**” button.
- i. Leave all remaining user settings at default values.
- j. Press the “**QUIT**” button once to return to the “**Main Menu**” screen, and twice to return to the screen you started out at.

5.0 USING THE GPS III+ UNIT

- A. Try to give the antenna a clear and unobstructed view of the sky.
- B. Turn the unit on by pressing and holding the red “**POWER**” button until the screen turns on.
- C. Allow the unit approximately one minute to acquire satellite information. Do not move the unit during this process.
- D. After the unit has switched from the “**Satellite Status Page**” to the “**Map Page**,” it is ready for use. If you switch back to the “**Satellite Status Page**,” it should read “**3D Navigation**” at the top of the screen.
- E. The unit has six main pages that are linked together and provide content related information to the user. Pressing the “**PAGE**” key moves through the main pages in normal fashion. The “**QUIT**” key moves through the pages in reverse order.
- F. Each page has a menu screen used to change fields/settings or input data. Pressing the “**MENU**” button once on one of these menu screens can access the menu screens. Pressing the MENU button again will bring up the “**Main Menu**” for the unit, where you can access the “**Setup**” screen along with other features.
- G. Turn the unit off by pressing and holding the red “**POWER**” button until the screen turns off.

6.0 DATA COLLECTION PROCEDURES

6.1 Waypoint naming convention

- A. Before the unit is taken out in the field a suitable naming convention will be developed between the Bureau’s/Program’s GPS Administrator and the field operator.
- B. One suggestion is to have the person in charge of the unit set a “dummy” waypoint at a predetermined three digit number, such as 500, before it is handed out.
- C. After this “dummy” waypoint is set, each new waypoint collected in the field will be automatically numbered consecutively by the unit starting with 501, 502, 503,
- D. If this method is used you may skip steps 6.2.C.a-d, because you will not need to alter the name of the waypoint.
- E. A log should be taken out in the field to record and link the waypoint name/number with a more detailed description of the location. The three digit waypoint numbers stored by the unit can then use this log to identify the

waypoints. This is necessary because the unit can only store six characters in the waypoint name field; many times more than six characters are needed to describe the point.

- F. The information included in the log can later be added to the ASCII text file created when the data is processed. See 7.0.B.r of this document.

6.2 Instant reading waypoint collection

- A. Go to either the “**Map Page**” or “**Position Page**.”
- B. With the unit held steady at the desired location, hold down the “**ENTER/MARK**” button until “**Mark Waypoint**” screen pops up.
- C. If you wish to change the waypoint name/number follow steps below, otherwise skip to 6.2.D.
 - a. Highlight the name field to the left of “**Done**” using the rocker keypad and press the ENTER button.
 - b. Input a name for the waypoint by using the rocker keypad. Up and down go through the available characters. Left and right changes the position of the cursor. The waypoint name can be up to six characters.
 - c. Press the “**ENTER**” button to store the edited waypoint name.
 - d. Use the rocker keypad to highlight “**Done**.”
- D. Press the “**ENTER**” button to save your position.
- E. Write down any additional data about the waypoint on a log sheet.

6.3 Average position waypoint collection

- A. Follow the above procedure.
- B. With the unit in the same position that the waypoint was taken, press the “**MENU**” button, highlight “**Average Position**” and press the “**ENTER**” button.
- C. Highlight “**Save**” and press the “**ENTER**” button when the “**Estimated Accuracy**” field and/or “**Measurement Count**” field reaches the desired value. **DO NOT** move the unit while averaging the position.
- D. Highlight “**Done**” and press the “**ENTER**” button to save your position.
- E. It takes about 1 minute to collect 60 measurement counts.

6.4 Accuracy of waypoint collection

- A. With SA turned off you can expect the Garmin III+ GPS unit to calculate it's location within **4-7 meters (12-20 ft.)** of it's true position, but if the unit does not have good satellite coverage that range could increase to **10-20 meters (33-66 ft.)**
- B. With SA turned on you can expect errors of **100 meters (330 ft.)** when taking an instant reading waypoint. Using the average position format for waypoint collection may help to reduce the error.
- C. Methods to reduce error
 - a. Avoid electrical interference; i.e. avoid taking measurements near electrical substations or high voltage power lines.
 - b. Make sure antenna has a clear view of sky. (Try to stay away from

- areas with dense vegetation overhead.)
- c. **Check the Estimated Position Error (EPE) and Dilution of Precision (DOP) on the Satellite Status Page.** Low numbers are better accuracy, and high numbers are worse for each. The **DOP** measures satellite geometry quality on a scale of one to ten. The **EPE** uses the **DOP** to calculate a horizontal position error in feet/meters. **A DOP <4.0 shall be required for all waypoints submitted for database/mapping purposes.**
 - d. Check the **Satellite Status Page** and make sure the unit has a good lock on at least four satellites. The unit works best when it is receiving strong signals from many satellites located at different angles from the unit. The left side of the screen shows the position of the satellites in the sky. The satellites are displayed by an assigned number. Highlighted satellites are being used by the unit to determine its location. The right side of the screen shows the strength of each satellite signal the unit is receiving. The higher the bar the better the signal. A grey bar indicates that the unit has found the satellite and the receiver is collecting data from it. A black bar indicates that the unit is using that satellite to calculate its position.
 - e. If available, a powered antenna can help to reduce error by improving the reception of satellite signals.

7.0 DATA PROCESSING

- A. Uploading Waypoint data from Garmin unit to a PC using *MapSource*® software
 - a. Connect the Garmin to the PC using the supplied interface cable.
 - b. In the menu bar go to “**File / Open From GPS...**”
 - c. Select waypoints and click on “**OK.**”
 - d. By clicking on the waypoint tab on the left of the screen you can see a list of all the waypoints you have collected.
 - e. Save the *MapSource*® file (*.mps) for future reference.
 - 1. In the menu bar go to “**File / Save as...**”
 - 2. Type the desired name for the file in the File Name field. The file name chosen should conform to your Bureau's/Program's SOPs.
 - 3. Hit “**ENTER**” to save the file.
- B. Export waypoint data from *MapSource*® program to an ASCII comma delimited text file.
 - a. Select the waypoint tab in the left hand window.
 - b. Select all of the waypoints from the left of the screen that you want exported using a shift or control click (**Ctrl + A** selects all).
 - c. Copy (**Ctrl + C**) the waypoints to the clipboard.
 - d. Open a spreadsheet program such as Corel Quattro Pro.
 - e. Paste (**Ctrl + V**) the waypoints to a worksheet.
 - f. This will create a spreadsheet giving you a table of information regarding

your waypoints. Included are the waypoint name, time and date of waypoint collection, and the lat/long coordinates of the waypoint.

- g. Select the column with the lat/long coordinates.
- h. Select “**Tools / Data Tools / Quick Columns.**”
- i. Select the “**Block**” option for the source.
- j. Select the Destination columns by clicking on the arrow button next to the entry block. This will temporarily close the Quick columns Expert window to allow you to select these columns. Select the currently selected column and the one next to it using a shift click, then click on the “**Maximize**” button on the Quick columns Expert window.
- k. Click the “**Options**” button.
- l. Select “**Delimited**” from the “**Data Type**” pull down.
- m. Select “**Space**” for the delimiting type (selection buttons).
- n. Click “**OK.**”
- o. Click “**Parse.**”
- p. Click “**Yes**” to overwrite the existing data.
- q. The coordinates should now be in two columns one for the latitude and one for the longitude
- r. Delete the columns you do not need (Symbol & Name, Unknown). Make any editorial changes you need to make to Descriptions, ID numbers, etc. Be VERY careful NOT to alter the coordinates. You will NOT need to add column headings. The GIS analyst will add them.
- s. Saving this file as an ASCII text file in comma delimited form.
 - 1. In the menu bar go to “**File / Save as...**”
 - 2. Type the file name in the File Name field. The file name should include g3 (to indicate that a Garmin GPS III+ was used to collect the data), the first, middle and last initials of the person who collected the data, and the three-digit day of year with underscores between the three. (For example: g3_jjc_108 would indicate that a Garmin GPS III+ was used by James Joseph Cronin on April 17 to collect the points. If two people have the same initials use the first two initials and a last name to differentiate between the two.)
 - 3. Click on the File Type field and scroll down to select **ASCII Text** (“Comma delimited”).
 - 4. Hit “**ENTER**” to save the file.
 - 5. The file should be put on a shared drive under a directory used to store ASCII text files including waypoint data and under a sub-directory indicating what year the information in the file came from.
- t. Printing out this file will give you all the information you need to enter the locations into the GIS “FEATURE DATA” database of KDHE points, except for the county that the point is located in.

- C. Using the information in the ASCII text file the feature locations can be entered into a larger database of KDHE sites using a Lotus Notes application called “FEATURE DATA.” If interested, contact the GIS Unit at (785) 296-8078 for status and participation.

8.0 TROUBLESHOOTING

- A. If the batteries run low, a warning box titled “**Battery Power Low**” will pop up on the screen. If you see this you should replace the batteries.
- B. If the unit is not under sufficient satellite coverage, a warning box titled “**Poor GPS Coverage**” will pop up on the screen. If you see this, you need to move to another location to give the antenna a clearer view of the sky.
- C. If a message pops up on the screen that you don’t understand, refer to *Appendix E* in the Owner’s Manual & Reference to get a description of the message.
- D. If any irresolvable or unrecognizable problem occurs with the unit while being used for field data collection, the unit is to be turned off and returned to the Bureau’s/Program’s GPS Administrator for inspection.

9.0 DATA OUTPUT

- A. Once features are entered into the database, you can use software such as Crystal, ArcView, and VB Viewer to create a table of features that suit your needs.
- B. This table can then be used in ArcView to create a map of your feature locations.
- C. With assistance from the GIS unit, you can get the features included on the KDHE Intranet IMS site, which will place your features on a map.
- D. Any questions regarding map or table creation of desired feature locations should be directed to the GIS unit at (785) 296-8078.
- E. The *MapSource*® software can also be used to perform a variety of tasks.

10.0 GLOSSARY OF TERMS

ASCII comma delimited text file	A file that separates columns of information with commas.
AshTech Reliance	A GPS unit that is more accurate than the Garmin GPS III+.
Average Position Waypoint Collection	Allows the user to average position samples over time and save the averaged result as a waypoint. Averaging reduces the effects of selective availability on position error and results in a more accurate position reading.
AutoLocate	The unit searches for available satellites to determine its position. This option is useful after relocating a long distance (>500 miles) from the last

	location the GPS III+ was used.
Dilution of Precision (DOP)	A measure of the GPS receiver-satellite geometry. A low DOP value indicates higher accuracy. The DOP indicators are GDOP (geometric DOP), PDOP (position DOP), HDOP (horizontal DOP), VDOP (vertical DOP), and TDOP (Time clock offset).
Estimated Position Error (EPE)	A measurement of horizontal position error in feet or meters based upon a variety of factors including DOP and satellite signal quality.
Feature Data database	A KDHE GIS database designed to store GPS information for various feature locations. It is currently in the testing phase.
Geographical Information System (GIS)	A computer system for capturing, storing, checking, integrating, manipulating, analyzing and displaying data related to positions on the Earth's surface.
Global Positioning System (GPS)	A global navigation system based on 24 satellites orbiting the earth at an altitude of 10,900 miles and providing very precise, worldwide positioning and navigation information 24 hours a day, in any weather. Also called the NAVSTAR system.
Horizontal Positional Accuracy	The accuracy of a location on a 2D surface.
Instant Reading Waypoint Collection	The unit takes it's current position reading and saves it as a waypoint.
Selective Availability (SA)	This is an artificial error introduced into the satellite data by the US DoD to reduce the possible accuracy of a position to 100 meters for commercial users. SA was turned off on 5/01/2000 through a federal executive order to encourage the use of GPS units for non-military purposes. It can be turned on again for national security reasons at any time.
Waypoint	The technical term for a location whose coordinates you store.

11.0 CHECKLIST OF APPLICABLE FIELD EQUIPMENT AND SUPPLIES

Garmin GPS III+ unit
Owner's Manual & Reference Guide
Carrying case

Cigarette lighter power adapter
PC Interface Cable
Garmin *MapSource*® software CD
Notebook for logging data
Powered antenna (optional)